



GEORGE ENGELMANN BOTANICAL NOTEBOOKS

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HEAVY RAINS AT ST. LOUIS.

BY DR. G. ENGELMANN.

(From the *Transactions of the Acad. of Sci. of St. Louis*, vol. II., p. 266-7.)

The heavy rains of the 29th and 30th of March last have induced me to examine my meteorological records, in which every fall of rain since January 1, 1838, is noted. As the result of these investigations, I lay before the Academy the following table of the heaviest falls of rain in every year, and of all the rains over 4 inches. It will be seen that the maximum in one year (1842) was not quite 2 inches; in 7 years (1838, '39, '43, '53, '57, '61, and '64) it was between 2 and 3 inches; in 7 years (1840, '43, '49, '51, '56, '60, and '63) it reached between 3 and 4 inches; in 8 years (1841, '44, '46, '50, '54, '55, '62, and '65), between 4 and 5 inches; in 2 years (1852 and '58), between 5 and 6 inches; in 1847, between 6 and 7 inches; and twice (in 1848 and 1859) over 7 inches.

In 13 years, therefore, more than 4 inches of water were precipitated in a single fall of rain; generally only once in one year, but in 1858 twice; and four times in the memorable wet year of 1848.

Of the 32 heavy rains recorded in the table, one-fourth (or 8) fell in June; 5 in May; as many in August; 3 in March; 2 each in April, July, October, and December; one only in January, February, and November; and none in September: 17, therefore, or over one half, fell in our rainy season of three months, from the middle of April to the middle of July;* 5, or nearly one sixth, fall in the month of August, and the other 10 are distributed through the other eight months of the year.

Heaviest Rains in St. Louis in every year from 1838 to 1865, and all Rains over four inches during that period of 28 years.

Date.	Hours within which the Rain fell.	Amount of Rain in inches.
1838. January 6-7	14	2.07
1839. June 7-8	30	2.81
1840. October 18	21	3.73
1841. August 22	5	4.78
1842. June 30	16	1.96
1843. June 9	2	2.30
1844. May 15-16	33	4.37
1845. May 22	11	3.70
1846. June 3-4	15	4.00
1847. October 20-22	49	6.59
1848. May 6	3	5.22
" June 2	5	6.17
" June 21-22	29	7.55
" August 15	1	5.05
1849. July 5-6	30	3.88
1850. November 26-27	26	4.38
1851. August 2-3	21	3.95
1852. March 11-13	53	5.54
1853. May 2-3	35	2.88

* The true rainy season generally extends only over about six weeks, which fall between the limits above assumed.

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1854.	April 26-27	22	4.34
1855.	August 15	8	4.19
1856.	April 30	5	3.80
1857.	February 6	9	2.91
1858.	July 11	10	4.18
"	December 4	15	5.00
1859.	June 18-20	30	7.83
1860.	June 2-3	12	3.73
1861.	March 31	10	2.34
1862.	December 13-14	30	4.47
1863.	August 9-10	26	3.86
1864.	May 10	10	2.34
1865.	March 29-30	40	4.90

These heavy rains are often local, and can then have but little influence on the general humidity of the season, or on the stage of the river; it is only when they extend over a large district of country, that they materially swell such a large river as the Mississippi; and the rains of March 29th and 30th last must have been such, as the river at this point rose between five and six feet by April 1st. On the other hand, we find the river not unusually high in 1848, when, here in St. Louis, such enormous quantities of rain fell; while during the high floods of 1844 and 1851 no extraordinary rains visited us; the rains in those years must have more uniformly extended over a large tract of country.

A few remarkable facts in connection with the falls of rain were noted in examining my records. The heaviest rains and most of them fell in the year 1848, between May 6th and August 15th, when 24 inches descended within 38 hours, distributed over five days.

The severest fall of rain in the shortest time took place on August 15, of the same year, when in 75 minutes 5.05 inches of rain descended.

The longest continued wet weather I ever observed here occurred in 1845, when it rained every day from June 15 to June 28, fourteen days, but altogether not more than 7.91 inches.



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REMARKS ON *VIBURNUM* AND *CORNUS*.

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He then made some remarks about the fruit and seed of different species of *Viburnum*. Unfortunately botanists too frequently neglect to gather the ripe fruit, and the herbaria that he consulted furnished but scanty material for the interesting investigations he had instituted, and which he intended to prosecute. The fruit, he stated, was described as an oval drupe or berry, red, dark blue, or black, with a juicy and edible pulp, and a crustaceous stone containing the minute embryo in a fleshy albumen. He found the berries of different sizes and generally more or less compressed, but, on the whole, offering no useful diagnostic characters, as might be expected of such a pulpy fruit. The pulp contains, as is well known, saccharine matter (especially in our common "black haw," *Viburnum prunifolium*), or it is more or less acidulous (e. g. in the "tree-cranberry," *V. Opulus*); but he had found as a remarkable exception one species, the rare *V. scabrellum*, specimens of which, collected in Mississippi by Prof. E. Hilgard, were examined, with a pulp as oily as that of any *Nyssa* or of *Olea* itself.

The most important diagnostic characters are found in the stone and the albumen. The stone is either flattened or it is thick, even, or marked with longitudinal grooves and ridges; the albumen is described as fleshy, but he would rather call it horny, and it contains some oil; it is even and uniform, principally in the flat-seeded species, or more or less folded, or (as it is termed) ruminated, especially in the thick-seeded species.

In the following table are enumerated all the species the fruits of which he could examine.

VIBURNUM.

A. Stone flattened, oval, or orbicular; albumen even.

a. Stone without distinct markings.

1. *V. prunifolium* (St. Louis and Texas), 10 mm. long, $8\frac{1}{2}$ mm. wide.
2. *V. Lentago* (Pennsylvania) - 10-11 " " 8 " "
3. *V. obovatum* (Georgia) - - $6\frac{1}{2}$ -8 " " $4\frac{1}{2}$ -6 " "
4. *V. nudum* (N. Hamp. & Mississippi), $5\frac{1}{2}$ -6 " " $4\frac{1}{2}$ -5 " "
5. *V. Opulus* (Germany, Illinois) - $7-8\frac{1}{2}$ " " $5-7\frac{1}{2}$ " "
- Var. *edule* (Wisconsin) - - $6\frac{1}{2}-7\frac{1}{2}$ " " $7\frac{1}{2}-8$ " "

b. Stone with 3 more or less distinct grooves on flat or ventral, and 2 on convex or dorsal surface.

6. *V. pauciflorum* (Rocky Mountains), $5\frac{1}{2}$ mm. long, 5 mm. wide.
7. *V. acerifolium* (Wis., N. Hamp., Ga.) $6\frac{1}{2}$ -7 " " $5\frac{1}{2}-6\frac{1}{2}$ " "
8. *V. pubescens* (Wisconsin, Louisiana) 6-7 " " $5\frac{1}{2}$ " "
9. *V. dentatum* (Wisconsin, unripe) 8 " " $4\frac{1}{2}$ " "

B. Stone thick, much longer than wide.

a. Stone somewhat compressed; albumen not (in 10) or slightly (in 11) ruminated.

10. *V. scabrellum* (Mississippi), with one wide ventral groove, - - - 7 mm. long, $4\frac{1}{2}$ mm. wide.
11. *V. lantanoides* (Massachusetts), with six distinct grooves, - - - 7 " " 5 " "

b. Stone oval or subglobose, not compressed.

a. Stone with a narrow and deep ventral groove; albumen deeply excavated, slightly ruminated.

12. *V. microcarpum* (Mexico) - - 4 mm. long. $3\frac{1}{2}$ mm. wide.
13. *V. odoratissimum* (India) - - 8-9 " " $5\frac{1}{2}$ " "

β. Stone with very slight grooves, albumen oval, not excavated, very deeply ruminated.

14. *V. Tinus* (Southern Europe) - $6\frac{1}{2}$ -8 mm. long, $5-5\frac{1}{2}$ mm. wide.
15. *V. rugosum* (Canary Islands), - 8-9 " " 5-6 " "



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The stones of *V. prunifolium* and *Lentago* he was unable to distinguish, and he almost felt inclined to unite both, as, in our neighborhood at least, the former was a most variable plant with broad or narrow, obtuse, acute or acuminate, glabrous or rusty leaves, and larger or smaller flowers, growing in rocky woods or in deep bottoms, and with many approaches to the eastern *V. Lentago*, which, in its typical form, was not found here.

In *V. nudum* and still more in *V. obovatum*, the markings so characteristic of *V. acerifolium* are already present, though not very distinct.

The stones of the European and the American *V. Opulus* which he could examine, were all broadly oval and longer than wide; but a few specimens of what was labelled *V. edule* had stones broader than long and deeply emarginate at base; further investigation must show whether this is a constant character, perhaps with others sufficient to re-establish that species of Purshian. The only fruit of *V. dentatum* he could examine was unripe, and the stone was no doubt narrower than it would be in the ripe berry.

Among the fruits of *Viburna*, mostly from the East Indies, obligingly communicated by Prof. A. Gray, he found those of *V. punctatum* similar to *V. nudum*, though larger; *V. erosum*, of Japan, with a lenticular irregularly marked stone, might also belong here; *V. orientale*, of the Caucasus, was the representative of our *V. acerifolium*; the red-fruited *V. cotinifolium*, *premnaceum*, *stellulatum*, and perhaps *Colbrookianum*, had stones similar to our black-fruited *dentatum* and *pubescens*, though narrower. The stones of *V. plicatum*, of Japan, *V. Simonsii*, *erubescens*, and also of *grandiflorum*, were like those of our *V. scabrellum*.

For those species of *Viburnum*, he had more fully examined, he would suggest the following arrangement, in which he had been obliged to overlook the presence or absence of a radiated inflorescence, which heretofore constituted the principal character of the sections of this genus:

1. *Opulus* would comprise species 5-7 with lobed leaves, radiated or uniform cymes, red or black-red berries, and flat, smooth or marked stones.

2. *Lentago* with species 1-4; leaves serrulate or sometimes entire, glabrous or squamulate, cymes even, berries bluish-black, stones flat, not or scarcely marked.

3. *Lantana* with species 8-11; leaves finely or coarsely dentate, glabrous or often with stellate pubescence, cymes even or, rarely, radiate, berries bluish-black, stones strongly marked, compressed or tumid. This section might be subdivided according to the form of the stones above described.

4. *Tinus* with species 12-15; leaves perennial (always?), entire or minutely sinuate-toothed, cymes even, berries purple or black, often shining, stones tumid with ruminated albumen.

In explanation of the measurements given in the above table he would add, that he had, in conformity with the usage now almost universal among men of science, adopted the French decimal measure, and hoped it would supersede even in common life the inconvenient measure of feet, inches, and lines. For those not familiar with it, it will suffice to state that the millimetre is about equal to half a line.

Dr. Engelmann had observed similar, though not as strongly marked differences in the fruits and stones of the different species of *Cornus*. Thus, the stone of our common *C. asperifolia* (a small tree with us) is subglobose, small, nearly smooth, marked with very slight furrows; the eastern *C. circinata* has larger stones, marked by indistinct undulations; the low, shrubby *C. sericea* of our swamps bears a stone twice as large, and quite knotty, with thick ridges; our Dogwood, *C. florida*, has a larger and elongated stone, acute at both ends, and slightly grooved; the stone of the nearly allied Californian *Cornus Nuttallii* is still larger, obtuse at both ends, and scarcely grooved, and that of the northern *C. Canadensis* is from a rounded base elongated to a pointed tip, and is perfectly smooth. He solicited botanists to furnish him with ripe fruit of any species of *Viburnum* and *Cornus* within their reach, so as to enable him to prosecute these investigations.

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Heaviest Rains in St. Louis in every year from 1838 to 1865, and all Rains over four inches during that period of 28 years.

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1854.	April 26-27	22	4.34
1855.	August 15	8	4.19
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1857.	February 6	9	2.91
1858.	July 11	10	4.18
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1859.	June 18-20	30	7.83
1860.	June 2-3	12	3.73
1861.	March 31	10	2.34
1862.	December 13-14	30	4.47
1863.	August 9-10	26	3.86
1864.	May 10	10	2.34
1865.	March 29-30	40	4.90

These heavy rains are often local, and can then have but little influence on the general humidity of the season, or on the stage of the river ; it is only when they extend over a large district of country, that they materially swell such a large river as the Mississippi ; and the rains of March 29th and 30th last must have been such, as the river at this point rose between five and six feet by April 1st. On the other hand, we find the river not unusually high in 1848, when, here in St. Louis, such enormous quantities of rain fell; while during the high floods of 1844 and 1851 no extraordinary rains visited us ; the rains in those years must have more uniformly extended over a large tract of country.

A few remarkable facts in connection with the falls of rain were noted in examining my records. The heaviest rains and most of them fell in the year 1848, between May 6th and August 15th, when 24 inches descended within 38 hours, distributed over five days.

The severest fall of rain in the shortest time took place on August 15, of the same year, when in 75 minutes 5.05 inches of rain descended.

The longest continued wet weather I ever observed here occurred in 1845, when it rained every day from June 15 to June 28, fourteen days, but altogether not more than 7.91 inches.



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BY DR. G. ENGELMANN.

(From the *Transactions of the Acad. of Sci. of St. Louis*, vol. II., p. 269-271.)

He then made some remarks about the fruit and seed of different species of *Viburnum*. Unfortunately botanists too frequently neglect to gather the ripe fruit, and the herbaria that he consulted furnished but scanty material for the interesting investigations he had instituted, and which he intended to prosecute. The fruit, he stated, was described as an oval drupe or berry, red, dark blue, or black, with a juicy and edible pulp, and a crustaceous stone containing the minute embryo in a fleshy albumen. He found the berries of different sizes and generally more or less compressed, but, on the whole, offering no useful diagnostic characters, as might be expected of such a pulpy fruit. The pulp contains, as is well known, saccharine matter (especially in our common "black haw," *Viburnum prunifolium*), or it is more or less acidulous (e. g. in the "tree-cranberry," *V. Opulus*); but he had found as a remarkable exception one species, the rare *V. scabrellum*, specimens of which, collected in Mississippi by Prof. E. Hilgard, were examined, with a pulp as oily as that of any *Nyssa* or of *Olea* itself.

The most important diagnostic characters are found in the stone and the albumen. The stone is either flattened or it is thick, even, or marked with longitudinal grooves and ridges; the albumen is described as fleshy, but he would rather call it horny, and it contains some oil; it is even and uniform, principally in the flat-seeded species, or more or less folded, or (as it is termed) ruminated, especially in the thick-seeded species.

In the following table are enumerated all the species the fruits of which he could examine.

VIBURNUM.

A. Stone flattened, oval, or orbicular; albumen even.

a. Stone without distinct markings.

1. *V. prunifolium* (St. Louis and Texas), 10 mm. long, $8\frac{1}{2}$ mm. wide.
2. *V. Lentago* (Pennsylvania) - 10-11 " " 8 " "
3. *V. obovatum* (Georgia) - 6 $\frac{1}{2}$ -8 " " $4\frac{1}{2}$ -6 " "
4. *V. nudum* (N. Hamp. & Mississippi), 5 $\frac{1}{2}$ -6 " " $4\frac{1}{2}$ -5 " "
5. *V. Opulus* (Germany, Illinois) - 7-8 $\frac{1}{2}$ " " 5-7 $\frac{1}{2}$ " "
- Var. *edule* (Wisconsin) - 6 $\frac{1}{2}$ -7 $\frac{1}{2}$ " " 7 $\frac{1}{2}$ -8 " "

b. Stone with 3 more or less distinct grooves on flat or ventral, and 2 on convex or dorsal surface.

6. *V. pauciflorum* (Rocky Mountains), 5 $\frac{1}{2}$ mm. long, 5 mm. wide.
7. *V. acerifolium* (Wis., N. Hamp., Ga.) 6 $\frac{1}{2}$ -7 " " $5\frac{1}{2}$ -6 $\frac{1}{2}$ " "
8. *V. pubescens* (Wisconsin, Louisiana) 6-7 " " 5 $\frac{1}{2}$ " "
9. *V. dentatum* (Wisconsin, unripe) 8 " " $4\frac{1}{2}$ " "

B. Stone thick, much longer than wide.

a. Stone somewhat compressed; albumen not (in 10) or slightly (in 11) ruminated.

10. *V. scabrellum* (Mississippi), with one wide ventral groove, - - - 7 mm. long, $4\frac{1}{2}$ mm. wide.
11. *V. lantanoides* (Massachusetts), with six distinct grooves, - - - 7 " " 5 " "

b. Stone oval or subglobose, not compressed.

a. Stone with a narrow and deep ventral groove; albumen deeply excavated, slightly ruminated.

12. *V. microcarpum* (Mexico) - - 4 mm. long. $3\frac{1}{2}$ mm. wide.
13. *V. odoratissimum* (India) - - 8-9 " " $5\frac{1}{2}$ " "

β. Stone with very slight grooves, albumen oval, not excavated, very deeply ruminated.

14. *V. Tinus* (Southern Europe) - 6 $\frac{1}{2}$ -8 mm. long, $5-5\frac{1}{2}$ mm. wide.
15. *V. rugosum* (Canary Islands), - 8-9 " " 5-6 " "



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The stones of *V. prunifolium* and *Lentago* he was unable to distinguish, and he almost felt inclined to unite both, as, in our neighborhood at least, the former was a most variable plant with broad or narrow, obtuse, acute or acuminate, glabrous or rusty leaves, and larger or smaller flowers, growing in rocky woods or in deep bottoms, and with many approaches to the eastern *V. Lentago*, which, in its typical form, was not found here.

In *V. nudum* and still more in *V. obovatum*, the markings so characteristic of *V. acerifolium* are already present, though not very distinct.

The stones of the European and the American *V. Opulus* which he could examine, were all broadly oval and longer than wide; but a few specimens of what was labelled *V. edule* had stones broader than long and deeply emarginate at base; further investigation must show whether this is a constant character, perhaps with others sufficient to re-establish that species of Purshian. The only fruit of *V. dentatum* he could examine was unripe, and the stone was no doubt narrower than it would be in the ripe berry.

Among the fruits of *Viburnum*, mostly from the East Indies, obligingly communicated by Prof. A. Gray, he found those of *V. punctatum* similar to *V. nudum*, though larger; *V. erosum*, of Japan, with a lenticular irregularly marked stone, might also belong here; *V. orientale*, of the Caucasus, was the representative of our *V. acerifolium*; the red-fruited *V. cotinifolium*, *premnaceum*, *stellulatum*, and perhaps *Colbrookianum*, had stones similar to our black-fruited *dentatum* and *pubescens*, though narrower. The stones of *V. plicatum*, of Japan, *V. Simonsii*, *erubescens*, and also of *grandiflorum*, were like those of our *V. scabellum*.

For those species of *Viburnum*, he had more fully examined, he would suggest the following arrangement, in which he had been obliged to overlook the presence or absence of a radiated inflorescence, which heretofore constituted the principal character of the sections of this genus:

1. *Opulus* would comprise species 5-7 with lobed leaves, radiated or uniform cymes, red or black-red berries, and flat, smooth or marked stones.

2. *Lentago* with species 1-4; leaves serrulate or sometimes entire, glabrous or squamulate, cymes even, berries bluish-black, stones flat, not or scarcely marked.

3. *Lantana* with species 8-11; leaves finely or coarsely dentate, glabrous or often with stellate pubescence, cymes even or, rarely, radiate, berries bluish-black, stones strongly marked, compressed or tumid. This section might be subdivided according to the form of the stones above described.

4. *Tinus* with species 12-15; leaves perennial (always?), entire or minutely sinuate-toothed, cymes even, berries purple or black, often shining, stones tumid with ruminated albumen.

In explanation of the measurements given in the above table he would add, that he had, in conformity with the usage now almost universal among men of science, adopted the French decimal measure, and hoped it would supersede even in common life the inconvenient measure of feet, inches, and lines. For those not familiar with it, it will suffice to state that the millimetre is about equal to half a line.

Dr. Engelmann had observed similar, though not as strongly marked differences in the fruits and stones of the different species of *Cornus*. Thus, the stone of our common *C. asperifolia* (a small tree with us) is subglobose, small, nearly smooth, marked with very slight furrows; the eastern *C. circinata* has larger stones, marked by indistinct undulations; the low, shrubby *C. sericea* of our swamps bears a stone twice as large, and quite knotty, with thick ridges; our Dogwood, *C. florida*, has a larger and elongated stone, acute at both ends, and slightly grooved; the stone of the nearly allied Californian *Cornus Nuttallii* is still larger, obtuse at both ends, and scarcely grooved, and that of the northern *C. Canadensis* is from a rounded base elongated to a pointed tip, and is perfectly smooth. He solicited botanists to furnish him with ripe fruit of any species of *Viburnum* and *Cornus* within their reach, so as to enable him to prosecute these investigations.

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In 13 years, therefore, more than 4 inches of water were precipitated in a single fall of rain; generally only once in one year, but in 1858 twice; and four times in the memorable wet year of 1848.

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1854.	April 26-27	22	4.34
1855.	August 15	8	4.19
1856.	April 30	5	3.80
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1858.	July 11	10	4.18
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These heavy rains are often local, and can then have but little influence on the general humidity of the season, or on the stage of the river ; it is only when they extend over a large district of country, that they materially swell such a large river as the Mississippi ; and the rains of March 29th and 30th last must have been such, as the river at this point rose between five and six feet by April 1st. On the other hand, we find the river not unusually high in 1848, when, here in St. Louis, such enormous quantities of rain fell; while during the high floods of 1844 and 1851 no extraordinary rains visited us ; the rains in those years must have more uniformly extended over a large tract of country.

A few remarkable facts in connection with the falls of rain were noted in examining my records. The heaviest rains and most of them fell in the year 1848, between May 6th and August 15th, when 24 inches descended within 38 hours, distributed over five days.

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REMARKS ON VIBURNUM AND CORNUS.

BY DR. G. ENGELMANN.

(From the *Transactions of the Acad. of Sci. of St. Louis*, vol. II., p. 269-271.)

He then made some remarks about the fruit and seed of different species of *Viburnum*. Unfortunately botanists too frequently neglect to gather the ripe fruit, and the herbaria that he consulted furnished but scanty material for the interesting investigations he had instituted, and which he intended to prosecute. The fruit, he stated, was described as an oval drupe or berry, red, dark blue, or black, with a juicy and edible pulp, and a crustaceous stone containing the minute embryo in a fleshy albumen. He found the berries of different sizes and generally more or less compressed, but, on the whole, offering no useful diagnostic characters, as might be expected of such a pulpy fruit. The pulp contains, as is well known, saccharine matter (especially in our common "black haw," *Viburnum prunifolium*), or it is more or less acidulous (e. g. in the "tree-cranberry," *V. Opulus*); but he had found as a remarkable exception one species, the rare *V. scabellum*, specimens of which, collected in Mississippi by Prof. E. Hilgard, were examined, with a pulp as oily as that of any *Nyssa* or of *Olea* itself.

The most important diagnostic characters are found in the stone and the albumen. The stone is either flattened or it is thick, even, or marked with longitudinal grooves and ridges; the albumen is described as fleshy, but he would rather call it horny, and it contains some oil; it is even and uniform, principally in the flat-seeded species, or more or less folded, or (as it is termed) ruminated, especially in the thick-seeded species.

In the following table are enumerated all the species the fruits of which he could examine.

VIBURNUM.

A. Stone flattened, oval, or orbicular; albumen even.

a. Stone without distinct markings.

1. *V. prunifolium* (St. Louis and Texas), 10 mm. long, $8\frac{1}{2}$ mm. wide.
2. *V. Lentago* (Pennsylvania) - 10-11 " " 8 " "
3. *V. obovatum* (Georgia) - $6\frac{1}{2}$ -8 " " $4\frac{1}{2}$ -6 " "
4. *V. nudum* (N. Hamp. & Mississippi), $5\frac{1}{2}$ -6 " " $4\frac{1}{2}$ -5 " "
5. *V. Opulus* (Germany, Illinois) - $7-8\frac{1}{2}$ " " $5-7\frac{1}{2}$ " "
- Var. *edule* (Wisconsin) - $6\frac{1}{2}-7\frac{1}{2}$ " " $7\frac{1}{2}-8$ " "

b. Stone with 3 more or less distinct grooves on flat or ventral, and 2 on convex or dorsal surface.

6. *V. pauciflorum* (Rocky Mountains), $5\frac{1}{2}$ mm. long, 5 mm. wide.
7. *V. acerifolium* (Wis., N. Hamp., Ga.) $6\frac{1}{2}-7$ " " $5\frac{1}{2}-6\frac{1}{2}$ " "
8. *V. pubescens* (Wisconsin, Louisiana) $6-7$ " " $5\frac{1}{2}$ " "
9. *V. dentatum* (Wisconsin, unripe) 8 " " $4\frac{1}{2}$ " "

B. Stone thick, much longer than wide.

a. Stone somewhat compressed; albumen not (in 10) or slightly (in 11) ruminated.

10. *V. scabellum* (Mississippi), with one wide ventral groove, - 7 mm. long, $4\frac{1}{2}$ mm. wide.
11. *V. lantanoides* (Massachusetts), with six distinct grooves, - 7 " " 5 " "

b. Stone oval or subglobose, not compressed.

a. Stone with a narrow and deep ventral groove; albumen deeply excavated, slightly ruminated.

12. *V. microcarpum* (Mexico) - - 4 mm. long. $3\frac{1}{2}$ mm. wide.
13. *V. odoratissimum* (India) - - 8-9 " " $5\frac{1}{2}$ " "

β. Stone with very slight grooves, albumen oval, not excavated, very deeply ruminated.

14. *V. Tinus* (Southern Europe) - $6\frac{1}{2}-8$ mm. long, $5-5\frac{1}{2}$ mm. wide.
15. *V. rugosum* (Canary Islands), - 8-9 " " $5-6$ " "



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The stones of *V. prunifolium* and *Lentago* he was unable to distinguish, and he almost felt inclined to unite both, as, in our neighborhood at least, the former was a most variable plant with broad or narrow, obtuse, acute or acuminate, glabrous or rusty leaves, and larger or smaller flowers, growing in rocky woods or in deep bottoms, and with many approaches to the eastern *V. Lentago*, which, in its typical form, was not found here.

In *V. nudum* and still more in *V. obovatum*, the markings so characteristic of *V. acerifolium* are already present, though not very distinct.

The stones of the European and the American *V. Opulus* which he could examine, were all broadly oval and longer than wide; but a few specimens of what was labelled *V. edule* had stones broader than long and deeply emarginate at base; further investigation must show whether this is a constant character, perhaps with others sufficient to re-establish that species of Purshian. The only fruit of *V. dentatum* he could examine was unripe, and the stone was no doubt narrower than it would be in the ripe berry.

Among the fruits of *Viburna*, mostly from the East Indies, obligingly communicated by Prof. A. Gray, he found those of *V. punctatum* similar to *V. nudum*, though larger; *V. erosum*, of Japan, with a lenticular irregularly marked stone, might also belong here; *V. orientale*, of the Caucasus, was the representative of our *V. acerifolium*; the red-fruited *V. cotinifolium*, *premnaceum*, *stellulatum*, and perhaps *Colbrookianum*, had stones similar to our black-fruited *dentatum* and *pubescens*, though narrower. The stones of *V. plicatum*, of Japan, *V. Simonsii*, *erubescens*, and also of *grandiflorum*, were like those of our *V. scabellum*.

For those species of *Viburnum*, he had more fully examined, he would suggest the following arrangement, in which he had been obliged to overlook the presence or absence of a radiated inflorescence, which heretofore constituted the principal character of the sections of this genus:

1. *Opulus* would comprise species 5-7 with lobed leaves, radiated or uniform cymes, red or black-red berries, and flat, smooth or marked stones.

2. *Lentago* with species 1-4; leaves serrulate or sometimes entire, glabrous or squamulate, cymes even, berries bluish-black, stones flat, not or scarcely marked.

3. *Lantana* with species 8-11; leaves finely or coarsely dentate, glabrous or often with stellate pubescence, cymes even or, rarely, radiate, berries bluish-black, stones strongly marked, compressed or tumid. This section might be subdivided according to the form of the stones above described.

4. *Tinus* with species 12-15; leaves perennial (always?), entire or minutely sinuate-toothed, cymes even, berries purple or black, often shining, stones tumid with ruminated albumen.

In explanation of the measurements given in the above table he would add, that he had, in conformity with the usage now almost universal among men of science, adopted the French decimal measure, and hoped it would supersede even in common life the inconvenient measure of feet, inches, and lines. For those not familiar with it, it will suffice to state that the millimetre is about equal to half a line.

Dr. Engelmann had observed similar, though not as strongly marked differences in the fruits and stones of the different species of *Cornus*. Thus, the stone of our common *C. asperifolia* (a small tree with us) is subglobose, small, nearly smooth, marked with very slight furrows; the eastern *C. circinata* has larger stones, marked by indistinct undulations; the low, shrubby *C. sericea* of our swamps bears a stone twice as large, and quite knotty, with thick ridges; our Dogwood, *C. florida*, has a larger and elongated stone, acute at both ends, and slightly grooved; the stone of the nearly allied Californian *Cornus Nuttallii* is still larger, obtuse at both ends, and scarcely grooved, and that of the northern *C. Canadensis* is from a rounded base elongated to a pointed tip, and is perfectly smooth. He solicited botanists to furnish him with ripe fruit of any species of *Viburnum* and *Cornus* within their reach, so as to enable him to prosecute these investigations.

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HEAVY RAINS AT ST. LOUIS.

BY DR. G. ENGELMANN.

(From the *Transactions of the Acad. of Sci. of St. Louis*, vol. II., p. 266-7.)

The heavy rains of the 29th and 30th of March last have induced me to examine my meteorological records, in which every fall of rain since January 1, 1838, is noted. As the result of these investigations, I lay before the Academy the following table of the heaviest falls of rain in every year, and of all the rains over 4 inches. It will be seen that the maximum in one year (1842) was not quite 2 inches; in 7 years (1838, '39, '43, '53, '57, '61, and '64) it was between 2 and 3 inches; in 7 years (1840, '43, '49, '51, '56, '60, and '63) it reached between 3 and 4 inches; in 8 years (1841, '44, '46, '50, '54, '55, '62, and '65), between 4 and 5 inches; in 2 years (1852 and '58), between 5 and 6 inches; in 1847, between 6 and 7 inches; and twice (in 1848 and 1859) over 7 inches.

In 13 years, therefore, more than 4 inches of water were precipitated in a single fall of rain; generally only once in one year, but in 1858 twice; and four times in the memorable wet year of 1848.

Of the 32 heavy rains recorded in the table, one-fourth (or 8) fell in June; 5 in May; as many in August; 3 in March; 2 each in April, July, October, and December; one only in January, February, and November; and none in September: 17, therefore, or over one half, fell in our rainy season of three months, from the middle of April to the middle of July;* 5, or nearly one sixth, fall in the month of August, and the other 10 are distributed through the other eight months of the year.

Heaviest Rains in St. Louis in every year from 1838 to 1865, and all Rains over four inches during that period of 28 years.

Date.	Hours within which the Rain fell.	Amount of Rain in inches.
1838. January 6-7	14	2.07
1839. June 7-8	30	2.81
1840. October 18	21	3.73
1841. August 22	5	4.78
1842. June 30	16	1.96
1843. June 9	2	2.30
1844. May 15-16	33	4.37
1845. May 22	11	3.70
1846. June 3-4	15	4.00
1847. October 20-22	49	6.59
1848. May 6	3	5.22
“ June 2	5	6.17
“ June 21-22	29	7.55
“ August 15	1	5.05
1849. July 5-6	30	3.88
1850. November 26-27	26	4.38
1851. August 2-3	21	3.95
1852. March 11-13	53	5.54
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* The true rainy season generally extends only over about six weeks, which fall between the limits above assumed.

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BY DR. G. ENGELMANN.

(From the *Transactions of the Acad. of Sci. of St. Louis*, vol. II., p. 269-271.)

He then made some remarks about the fruit and seed of different species of *Viburnum*. Unfortunately botanists too frequently neglect to gather the ripe fruit, and the herbaria that he consulted furnished but scanty material for the interesting investigations he had instituted, and which he intended to prosecute. The fruit, he stated, was described as an oval drupe or berry, red, dark blue, or black, with a juicy and edible pulp, and a crustaceous stone containing the minute embryo in a fleshy albumen. He found the berries of different sizes and generally more or less compressed, but, on the whole, offering no useful diagnostic characters, as might be expected of such a pulpy fruit. The pulp contains, as is well known, saccharine matter (especially in our common "black haw," *Viburnum prunifolium*), or it is more or less acidulous (e. g. in the "tree-cranberry," *V. Opulus*); but he had found as a remarkable exception one species, the rare *V. scabrellum*, specimens of which, collected in Mississippi by Prof. E. Hilgard, were examined, with a pulp as oily as that of any *Nyssa* or of *Olea* itself.

The most important diagnostic characters are found in the stone and the albumen. The stone is either flattened or it is thick, even, or marked with longitudinal grooves and ridges; the albumen is described as fleshy, but he would rather call it horny, and it contains some oil; it is even and uniform, principally in the flat-seeded species, or more or less folded, or (as it is termed) ruminated, especially in the thick-seeded species.

In the following table are enumerated all the species the fruits of which he could examine.

VIBURNUM.

A. Stone flattened, oval, or orbicular; albumen even.

a. Stone without distinct markings.

1. *V. prunifolium* (St. Louis and Texas), 10 mm. long, $8\frac{1}{2}$ mm. wide.
2. *V. Lentago* (Pennsylvania) - 10-11 " " 8 " "
3. *V. obovatum* (Georgia) - $6\frac{1}{2}$ -8 " " $4\frac{1}{2}$ -6 " "
4. *V. nudum* (N. Hamp. & Mississippi), $5\frac{1}{2}$ -6 " " $4\frac{1}{2}$ -5 " "
5. *V. Opulus* (Germany, Illinois) - $7-8\frac{1}{2}$ " " $5-7\frac{1}{2}$ " "
- Var. *edule* (Wisconsin) - $6\frac{1}{2}-7\frac{1}{2}$ " " $7\frac{1}{2}-8$ " "

b. Stone with 3 more or less distinct grooves on flat or ventral, and 2 on convex or dorsal surface.

6. *V. pauciflorum* (Rocky Mountains), $5\frac{1}{2}$ mm. long, 5 mm. wide.
7. *V. acerifolium* (Wis., N. Hamp., Ga.) $6\frac{1}{2}-7$ " " $5\frac{1}{2}-6\frac{1}{2}$ " "
8. *V. pubescens* (Wisconsin, Louisiana) 6-7 " " $5\frac{1}{2}$ " "
9. *V. dentatum* (Wisconsin, unripe) 8 " " $4\frac{1}{2}$ " "

B. Stone thick, much longer than wide.

a. Stone somewhat compressed; albumen not (in 10) or slightly (in 11) ruminated.

10. *V. scabrellum* (Mississippi), with one wide ventral groove, - - - 7 mm. long, $4\frac{1}{2}$ mm. wide.
11. *V. lantanoides* (Massachusetts), with six distinct grooves, - - - 7 " " 5 " "

b. Stone oval or subglobose, not compressed.

a. Stone with a narrow and deep ventral groove; albumen deeply excavated, slightly ruminated.

12. *V. microcarpum* (Mexico) - - 4 mm. long, $3\frac{1}{2}$ mm. wide.
13. *V. odoratissimum* (India) - - 8-9 " " $5\frac{1}{2}$ " "

b. Stone with very slight grooves, albumen oval, not excavated, very deeply ruminated.

14. *V. Tinus* (Southern Europe) - $6\frac{1}{2}-8$ mm. long, $5-5\frac{1}{2}$ mm. wide.
15. *V. rugosum* (Canary Islands), - 8-9 " " 5-6 " "



0 1 2 3 4 5 6 7 8 9 10

cm

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The stones of *V. prunifolium* and *Lentago* he was unable to distinguish, and he almost felt inclined to unite both, as, in our neighborhood at least, the former was a most variable plant with broad or narrow, obtuse, acute or acuminate, glabrous or rusty leaves, and larger or smaller flowers, growing in rocky woods or in deep bottoms, and with many approaches to the eastern *V. Lentago*, which, in its typical form, was not found here.

In *V. nudum* and still more in *V. obovatum*, the markings so characteristic of *V. acerifolium* are already present, though not very distinct.

The stones of the European and the American *V. Opulus* which he could examine, were all broadly oval and longer than wide; but a few specimens of what was labelled *V. edule* had stones broader than long and deeply emarginate at base; further investigation must show whether this is a constant character, perhaps with others sufficient to re-establish that species of Purshian. The only fruit of *V. dentatum* he could examine was unripe, and the stone was no doubt narrower than it would be in the ripe berry.

Among the fruits of *Viburna*, mostly from the East Indies, obligingly communicated by Prof. A. Gray, he found those of *V. punctatum* similar to *V. nudum*, though larger; *V. erosum*, of Japan, with a lenticular irregularly marked stone, might also belong here; *V. orientale*, of the Caucasus, was the representative of our *V. acerifolium*; the red-fruited *V. cotinifolium*, *premnaceum*, *stellulatum*, and perhaps *Colbrookianum*, had stones similar to our black-fruited *dentatum* and *pubescens*, though narrower. The stones of *V. plicatum*, of Japan, *V. Simonsii*, *erubescens*, and also of *grandiflorum*, were like those of our *V. scabellum*.

For those species of *Viburnum*, he had more fully examined, he would suggest the following arrangement, in which he had been obliged to overlook the presence or absence of a radiated inflorescence, which heretofore constituted the principal character of the sections of this genus:

1. *Opulus* would comprise species 5-7 with lobed leaves, radiated or uniform cymes, red or black-red berries, and flat, smooth or marked stones.
2. *Lentago* with species 1-4; leaves serrulate or sometimes entire, glabrous or squamulate, cymes even, berries bluish-black, stones flat, not or scarcely marked.
3. *Lantana* with species 8-11; leaves finely or coarsely dentate, glabrous or often with stellate pubescence, cymes even or, rarely, radiate, berries bluish-black, stones strongly marked, compressed or tumid. This section might be subdivided according to the form of the stones above described.
4. *Tinus* with species 12-15; leaves perennial (always?), entire or minutely sinuate-toothed, cymes even, berries purple or black, often shining, stones tumid with ruminated albumen.

In explanation of the measurements given in the above table he would add, that he had, in conformity with the usage now almost universal among men of science, adopted the French decimal measure, and hoped it would supersede even in common life the inconvenient measure of feet, inches, and lines. For those not familiar with it, it will suffice to state that the millimetre is about equal to half a line.

Dr. Engelmann had observed similar, though not as strongly marked differences in the fruits and stones of the different species of *Cornus*. Thus, the stone of our common *C. asperifolia* (a small tree with us) is subglobose, small, nearly smooth, marked with very slight furrows; the eastern *C. circinata* has larger stones, marked by indistinct undulations; the low, shrubby *C. sericea* of our swamps bears a stone twice as large, and quite knotty, with thick ridges; our Dogwood, *C. florida*, has a larger and elongated stone, acute at both ends, and slightly grooved; the stone of the nearly allied Californian *Cornus Nuttallii* is still larger, obtuse at both ends, and scarcely grooved, and that of the northern *C. Canadensis* is from a rounded base elongated to a pointed tip, and is perfectly smooth. He solicited botanists to furnish him with ripe fruit of any species of *Viburnum* and *Cornus* within their reach, so as to enable him to prosecute these investigations.

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GEORGE ENGELMANN PAPERS



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